

Mobile Learning: The Current Landscape in the Department of Defense (DoD)



Advanced Distributed Learning (ADL) Co-Laboratories

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1. Introduction

The Advanced Distributed Learning (ADL) Initiative recognizes the ubiquity of mobile devices and believes continued research regarding their use is warranted. However, ADL recognizes that the selection of mobile technology should be driven by the learning requirements and not the other way around.

ADL defines mobile learning as the use of handheld computing devices to provide access to learning content and information resources. Mobile devices enable access to support and training materials at the moment of need. Driven by improved software, improved hardware, and evolving habits of mobile device users, the opportunities have increased even more significantly in the past few years. While mobile learning is not always appropriate as a training solution, it is now being considered as a part of the total learning and training support infrastructure.

Earlier this year, ADL conducted a survey to investigate mobile device proliferation and usage by a wide range of DoD stakeholders. The survey asked about:

- DoD concerns related to using mobile devices
- Most commonly used mobile device platforms by DoD stakeholders
- Use of DoD Learning Management System (LMS) environments supporting mobile delivery
- DoD stakeholders' attitudes regarding use of mobile devices for mandatory training versus desktop computer-based training

The results from this survey were used to help drive the conversion, development, and deployment decisions of an ADL study on the effectiveness of mobile course delivery. The results of the study will be presented at the 2011 I/ITSEC conference in Orlando, Florida. These survey results should also help to generate new ideas within the DoD learning community regarding the challenges associated with mobile deployment given the current landscape.

2. Survey Methodology

2.1. Target Population

The target population for this survey included DoD stakeholders with vested interests in technology-based training. Specifically, this survey was sent to the following:

- Select members of the Office of the Secretary of Defense (OSD) training group
- Members of the DoD ADL (DADL) Working Group
- Members of the DoD Mobile Working Group

Members of the OSD training group selected for this survey were involved with the mobile Trafficking in Persons (TIP) course and/or training within OSD. The DADL Working Group is an open-membership group of experts who are involved with or who have a vested interest in the content development, technical implementation, or support of many distributed learning environments for the DoD. The DoD Mobile Working Group is an informal group of DoD contacts interested in mobile learning, including decision-makers and government personnel in leadership positions.

2.2. Development of Survey Tool

The survey tool was initially developed by Jason Haag and Judy Brown of ADL, and was subsequently revised with input from Shenan Hahn of ADL and Linda Daniels of OSD.

2.3. Description of Survey Tool

Platform. The survey tool was created using Google Forms, a type of Google application. A Google Forms survey can be shared with others via a hyperlink that can be accessed online. Google Forms automatically records participants' answers in a spreadsheet (also stored online in Google). It also provides data presentation capabilities, such as the ability to create charts and graphs from the raw data and calculate percentages.

Survey format. The survey consisted of a series of non-free-form questions, in which a question was posed and participants had the option to select one of several pre-conceived answers. These questions included multiple choice (participants selected one or more options from a list of several), yes/no/not sure (participants selected only one of those three answer options), and 5-point Likert scale questions (participants rated the strength of their agreement or disagreement with a statement, or the likelihood of a certain outcome, on a scale of 1-5).

Topics addressed. In accordance with the goals of the project, several different topics were addressed in the questions. These included:

- **Demographics.** Information about the organization each respondent represents and their role within the organization.
- **Mobile integration plans.** Information about the respondent's or organization's plans to incorporate mobile technology into training, including the likelihood of incorporation and the predicted timeframe for doing so.
- **Current use of mobile technology.** Information about types of devices used by respondents, frequency of use, and organizational support (as well as LMS support) within the respondent's institution for mobile technology and mobile learning.
- **Importance of mobile issues.** Information about the importance of specific issues and concerns about integrating mobile technology for learning.

2.4. Execution

The survey was conducted over a period of four weeks, between 12 January 2011 and 16 February 2011. The survey was sent out, by email, in two waves within this time frame. Each group of recipients was allowed two weeks to complete the survey before it closed. During the first wave, the survey was distributed to members of the OSD training group. During the second wave, it was distributed to the DADL Working Group and the DoD Mobile Working Group. A total of 50 subjects responded among the three groups. The results were then collected and analyzed from the Google Forms database by Jason Haag, Tom Archibald, and Shenan Hahn.

2.5. Results & Analysis

A. Participants

The survey was distributed to 115 recipients with 50 people responding to the survey, generating a 43% response rate. Of these 50 responses, roughly 40% were from the Services:

- 18% U.S. Navy
- 14% U.S. Air Force
- 8% U.S. Army
- 60% from various Department of Defense organizations
 - 28% Defense Agency
 - 8% Combatant Command

- 6% Office of the Secretary of Defense
- 2% Joint Staff
- 16% Other

Participants included instructional designers, developers, managers, administrators, and others as illustrated in Figure 1 below. The survey question addressing organizational role allowed participants to select more than one role, as many of them perform multiple functions within their respective organizations.

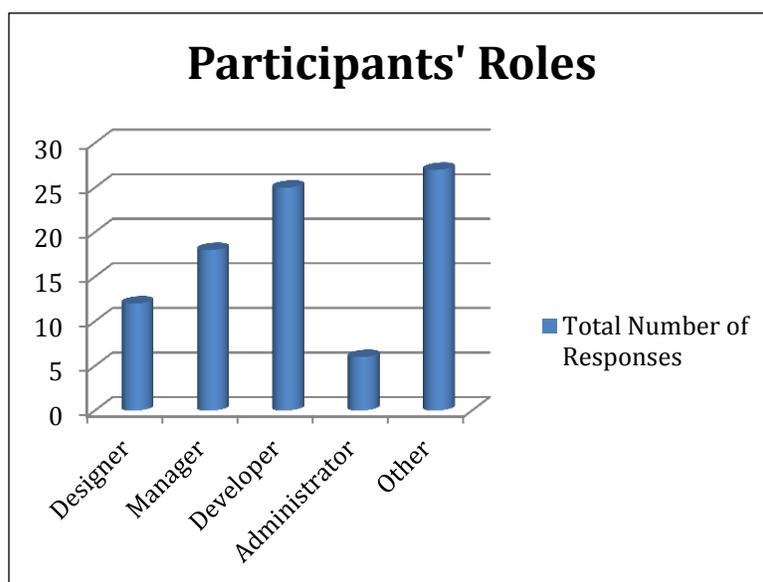


Figure 1. Survey participants' roles

The results of this survey are presented sequentially by question. The survey questions with accompanying responses are available upon request. Please contact adlmobile@adlnet.gov if you have any questions pertaining to the data collected in this survey.

A. Plans to Use Mobile

Question one asked participants to respond regarding the future use of mobile within their organization. Half of the respondents are either already using mobile technology (22%) or researching how to use mobile technology (28%). About 20% of respondents plan to use mobile technologies in the next 6-12 months, and one third of respondents do not have plans to use mobile technologies at this time.

B. Mobile Device Types

Question two queried participants regarding the mobile devices they currently use. Smartphone devices (e.g., touch screen, full browser/HTML support, Wi-Fi, 3G/4G, music player, GPS, video capable, Bluetooth enabled, accelerometer, 3D video acceleration, etc.) accounted for a quarter of the responses. Almost half of responses indicated use of basic mobile devices (voice and text messaging support only). The remaining quarter of responses accounted for a range of low-end (e.g., no touch support, limited web-browser support, limited memory) to high end (e.g., non-multi touch, include high-resolution camera, Bluetooth, and web support) mobile devices.

Respondents were allowed to select more than one device; because of this, it became apparent that some use two or more mobile devices on a regular basis. While the majority, at 62%, use only one mobile device regularly, 32% use two devices and 6% use a combination of three devices.

C. Use of Mobile Device to Access Online Content

Participants were asked in question three how often they use their mobile devices to access online content. Almost 60% said they use their mobile devices daily to access online content. Almost a quarter of respondents said they never use their devices to access online content. Less than a quarter responded that they use their mobile devices to access online content ranging anywhere from a few times per week to a few times per year.

D. Supported Mobile Devices in their Organizations

Question four asked participants which mobile device platforms were supported and/or targeted in their organizations. The Blackberry OS (51%) is the most frequently supported platform with iOS from Apple (13%) and Android from Google (12%) much less targeted. Windows Mobile (6%) and MeeGo from Nokia (3%) were also selected as targeted platforms. This survey question allowed participants to select more than one platform, as multiple platforms may be targeted within their respective organizations.

E. Mobile Devices and Learning Management Systems (LMS)

The next three survey questions (questions five, six, and seven) asked participants:

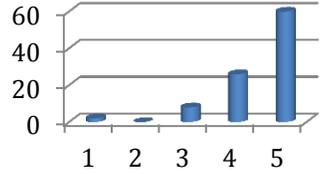
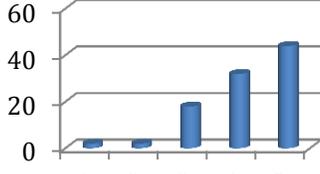
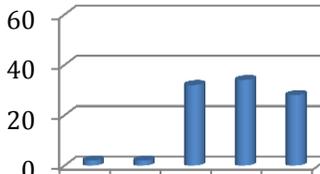
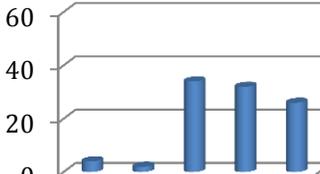
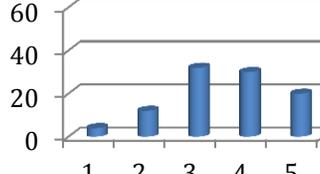
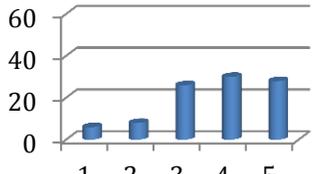
- if their organization currently uses an LMS to deliver self-paced training,
- if their organization offers a mobile-friendly version of their LMS for courses, and
- if the individual participants would desire to complete their annual training using a mobile device instead of a desktop computer.

Almost 75% of the respondents' organizations use an LMS to deliver self-paced training; however, of those whose organizations use an LMS, only 8% offer a mobile-friendly version of their LMS. One third of participants responded "yes" to desiring to receive their annual training using a mobile device, while another third responded "no", and the final third was unsure.

F. Importance of Mobile Device Issues and Concerns

The final series of questions in the survey asked participants to rate the importance of a variety of issues, from device security to connectivity/bandwidth, related to mobile devices. Each question was rated on a scale of one (unsure) to five (critical). Table 1 below provides a list of the issues, a brief description, and a summary of the response percentages for each item.

Table 1. Mobile Device Issues Ratings

Issue & Description	% of Responses (1 - Not Sure, 2 - Not Important, 3 - Important, 4 - Very Important, 5 - Critical)												
<p>Device Security Password protection and other controls to protect access to the device</p>	 <table border="1"> <caption>Device Security Response Data</caption> <thead> <tr> <th>Rating</th> <th>% of Responses</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>~5%</td> </tr> <tr> <td>2</td> <td>~2%</td> </tr> <tr> <td>3</td> <td>~10%</td> </tr> <tr> <td>4</td> <td>~25%</td> </tr> <tr> <td>5</td> <td>~60%</td> </tr> </tbody> </table>	Rating	% of Responses	1	~5%	2	~2%	3	~10%	4	~25%	5	~60%
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<p>Personal Accountability Measures that will help ensure individuals are responsible for their actions when using mobile devices</p>	 <table border="1"> <caption>Personal Accountability Response Data</caption> <thead> <tr> <th>Rating</th> <th>% of Responses</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>~5%</td> </tr> <tr> <td>2</td> <td>~5%</td> </tr> <tr> <td>3</td> <td>~20%</td> </tr> <tr> <td>4</td> <td>~35%</td> </tr> <tr> <td>5</td> <td>~45%</td> </tr> </tbody> </table>	Rating	% of Responses	1	~5%	2	~5%	3	~20%	4	~35%	5	~45%
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<p>Organizational Policy Internal policy that provides guidance for content access and device usage</p>	 <table border="1"> <caption>Organizational Policy Response Data</caption> <thead> <tr> <th>Rating</th> <th>% of Responses</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>~5%</td> </tr> <tr> <td>2</td> <td>~5%</td> </tr> <tr> <td>3</td> <td>~35%</td> </tr> <tr> <td>4</td> <td>~38%</td> </tr> <tr> <td>5</td> <td>~30%</td> </tr> </tbody> </table>	Rating	% of Responses	1	~5%	2	~5%	3	~35%	4	~38%	5	~30%
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<p>Ownership / Life Cycle Management Who will ultimately own the training content and how it is deployed to mobile devices</p>	 <table border="1"> <caption>Ownership / Life Cycle Management Response Data</caption> <thead> <tr> <th>Rating</th> <th>% of Responses</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>~5%</td> </tr> <tr> <td>2</td> <td>~5%</td> </tr> <tr> <td>3</td> <td>~38%</td> </tr> <tr> <td>4</td> <td>~35%</td> </tr> <tr> <td>5</td> <td>~30%</td> </tr> </tbody> </table>	Rating	% of Responses	1	~5%	2	~5%	3	~38%	4	~35%	5	~30%
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<p>Assessment & Testing Testing capabilities and offerings on mobile devices</p>	 <table border="1"> <caption>Assessment & Testing Response Data</caption> <thead> <tr> <th>Rating</th> <th>% of Responses</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>~5%</td> </tr> <tr> <td>2</td> <td>~15%</td> </tr> <tr> <td>3</td> <td>~35%</td> </tr> <tr> <td>4</td> <td>~35%</td> </tr> <tr> <td>5</td> <td>~25%</td> </tr> </tbody> </table>	Rating	% of Responses	1	~5%	2	~15%	3	~35%	4	~35%	5	~25%
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<p>Data at Rest & Records Management How to determine if one's data is no longer valid and when to exclude and/or expunge it from a device or system</p>	 <table border="1"> <caption>Data at Rest & Records Management Response Data</caption> <thead> <tr> <th>Rating</th> <th>% of Responses</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>~5%</td> </tr> <tr> <td>2</td> <td>~10%</td> </tr> <tr> <td>3</td> <td>~25%</td> </tr> <tr> <td>4</td> <td>~35%</td> </tr> <tr> <td>5</td> <td>~30%</td> </tr> </tbody> </table>	Rating	% of Responses	1	~5%	2	~10%	3	~25%	4	~35%	5	~30%
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<p>Connectivity & Band-width Ability to access the internet or other network connection and the speed of that connection</p>	<table border="1"> <caption>Connectivity & Band-width Importance Data</caption> <thead> <tr> <th>Rating</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>5</td> </tr> <tr> <td>2</td> <td>8</td> </tr> <tr> <td>3</td> <td>20</td> </tr> <tr> <td>4</td> <td>40</td> </tr> <tr> <td>5</td> <td>42</td> </tr> </tbody> </table>	Rating	Percentage	1	5	2	8	3	20	4	40	5	42
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<p>User experience / Usability Providing an optimal experience in terms of navigation and other user interface</p>	<table border="1"> <caption>User experience / Usability Importance Data</caption> <thead> <tr> <th>Rating</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>5</td> </tr> <tr> <td>2</td> <td>5</td> </tr> <tr> <td>3</td> <td>22</td> </tr> <tr> <td>4</td> <td>45</td> </tr> <tr> <td>5</td> <td>38</td> </tr> </tbody> </table>	Rating	Percentage	1	5	2	5	3	22	4	45	5	38
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<p>Device Fragmentation Supporting several mobile device platforms and possibly multiple versions of the device</p>	<table border="1"> <caption>Device Fragmentation Importance Data</caption> <thead> <tr> <th>Rating</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>12</td> </tr> <tr> <td>2</td> <td>10</td> </tr> <tr> <td>3</td> <td>28</td> </tr> <tr> <td>4</td> <td>42</td> </tr> <tr> <td>5</td> <td>18</td> </tr> </tbody> </table>	Rating	Percentage	1	12	2	10	3	28	4	42	5	18
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As is illustrated in Table 1 a majority of the participants consider all of the issues important. This result was expected. However, the results were further intended to reveal which issue rated the highest in terms of importance. Security, the highest rated, is also a top priority for all DoD eLearning systems.

3. Summary & Areas of Concern

The results of this survey may begin to help DoD stakeholders develop future research plans for using mobile devices to deliver courses or other types of learning activities. ADL will continue to research mobile learning and plans to continue collecting and analyzing this type of data for the foreseeable future. However, these survey results have implications that are of immediate value to ADL’s DoD stakeholders. The following issues and concerns are the most relevant in today’s landscape, and will most likely continue to be for several years to come.

3.1. Targeted Mobile Platforms & Security

Fifty-one percent of the respondents answered that BlackBerry devices are being targeted by their organizations. BlackBerry devices have widespread usage in the DoD for their security features and high-level encryption. This is a top priority for defense adopters across all sectors, especially those in tactical environments.

Mobile browser capabilities on the BlackBerry were limited until the recent release of the BlackBerry 6.0 platform, which now better supports HTML5. Previous versions of the BlackBerry OS and the BlackBerry browser have been reported to be largely fragmented (Frederick, 2009). Given this amount of fragmentation, providing mobile learning content consistently on older BlackBerry devices could only be accomplished by using native applications (apps), rather than the BlackBerry mobile web browser. Native apps are different from content developed for the mobile browser as they are specifically designed to run locally on a device’s operating system. Native apps can be developed to support both new and older versions of BlackBerry whereas developing content for the mobile browser to cover the full spectrum of BlackBerry devices is much more challenging.

There are a number of native app solutions available now in the mobile learning market, and many even provide the option to integrate with existing LMS environments. Many LMS vendors are now providing mobile versions

of their LMS as a native application offering. However, there aren't any existing use cases of DoD implementations of mobile learning with a LMS integration.

The Services have only just begun to investigate the opportunities afforded by mobile learning. If most of the DoD continues to use BlackBerry devices, they might consider leveraging this widespread availability, but only if the devices were equipped with sufficient data plans and supported a modern version of the BlackBerry OS. Current military network security restrictions will most likely prevent the BlackBerry (or any other government-issued mobile device) from being a viable solution to mobile learning until a DoD-wide security policy is in effect.

The answers in the survey reflect that some of the organizations were also targeting the Android OS, Apple iOS, and the now defunct Windows Mobile platform. These answers were most likely reflective of previous or ongoing mobile prototype efforts. An enterprise-wide approach and strategy to target any specific mobile platform(s) has not yet been developed by any of the Services. However, a new project recently funded by the Defense Advanced Research Projects Agency (DAPRA), called the "Transformative Apps Program" plans to address all of the technical, business, and operational challenges faced by the DoD Services in supporting mobile applications in the field within both commercial and tactical networks. For the initial implementation, all of the apps developed will target the Android platform. The end goal of the program is to transition the resulting systems and centralized military marketplace architecture for mobile applications to the Services. The program will address critical aspects of security vulnerabilities by leveraging existing state-of-the-art commercial solutions and overlay DoD-specific requirements.

Regardless of the platforms that will be targeted for mobile learning in the DoD, the issue of security will need to be addressed from not only a technical perspective, but also in terms of policy. The U.S. House of Representatives' Emerging Threats and Capabilities Subcommittee recently directed the Defense Chief Information Officer to develop policies for the use of smartphone applications on military networks (Brewin, 2011). The subcommittee directed the Defense CIO to issue instructions within six months of passage of the 2012 National Defense Authorization bill. This policy is slated to include development, test, certification, and accreditation standards for mobile applications. Until policy and a secure mobile application architecture model are implemented, it is unlikely that any specific device or platform will be targeted on military networks. In the meantime, unclassified content continues to be packaged and deployed by various DoD organizations and made available as native apps in commercial app stores and market places.

3.2. Leveraging Personal Mobile Devices & Data Plans

There is some evidence supporting the potential to leverage existing personally-owned smartphones and data plans for mobile learning. This is partially attributed to the fact that nearly 60% of the respondents use their personal mobile devices daily to access online content coupled with the fact that 25% of them already own smartphones. We expect these numbers to continue to rise on pace with the growth rate of the mobile smartphone market in the U.S. Nielsen reported that 31% of US mobile phone owners already have a smartphone as of December 2010, and expect smartphones to become the majority by the end of 2011 (The Nielsen Company, 2010).

According to a recent survey by Gartner, Inc. U.S. smartphone sales are expected to grow from 67 million units in 2010 to 95 million units in 2011. In addition, consumers in the United States are more likely to buy a smartphone in 2011 rather than PCs, mobile phones, e-readers, media tablets and gaming products. (Gartner, Inc., 2011)

A recent Forrester Research study showed 35% of workers in the United States either buy their own smartphone for work, use unauthorized Web sites or download unapproved software on a work computer (Rosenwald, 2011). Twenty four percent say the technology is better than what their employers provide. Thirty-six percent say they need it, and their employer won't provide an alternative. And nearly 40 percent said they used it at home and at work as well (Rosenwald, 2011).

In the Spring of 2010, the Marine Corps College of Distance Education and Training (CDET) conducted a survey of MarineNet users during a five-week period to capture data relating to mobile device proliferation among the

population of MarineNet users. This target population was considered to be the most likely candidates for potentially exploring mobile learning as an alternative or secondary option to eLearning content using the MarineNet system. Data was collected from roughly 50,000 respondents including active duty, reservists, and civilian users. Ninety percent of the respondents from this survey owned a non-government mobile device with 60% having a data plan for email and Internet access.

One particular overwhelming response to the CDET survey worth noting was that 100% of the respondents answered that they would consider searching for or looking up work-related manuals or documents on their mobile device. Another response of interest was that 60% of the respondents answered “yes” to expecting compensation if they needed to use their personal data plan to conduct official business while 32% answered “no.” It is uncertain whether there is any likelihood that some form of compensation would be provided for personal data plans. However, in terms of providing alternative access to learning materials, mobile devices still provide a promising future as in the case with the results from CDET survey reporting that 32% of users would not expect any compensation. The higher number of respondents expecting compensation is likely related to the fact that many carriers offer different types of data plans, and many data plans are now limiting data usage to 2 GB per month. If users exceed this limitation then additional charges may be incurred.

3.3. Mobile Learning Apps & Development

When surveying the respondents’ organizations that use an LMS, only 8% offer a mobile-friendly version of their LMS. ADL believes this low percentage of DoD stakeholders not having a mobile-friendly LMS implies that this alternative training opportunity of mobile learning has not been made available at this time. This correlates with the fact that 28% of the respondents are just now researching how to use mobile technology while one third of respondents do not have plans to use mobile technologies at this time.

While many LMS vendors are beginning to offer a mobile native app alternative, there are not many existing forms of LMS-dependent training content created specifically for mobile devices. Many of the solutions on the market today require that the learning content be embedded inside of the native app and bundled together. Rather than targeting one specific mobile device platform for developing content, it is possible to use existing web standards to create applications and content that will be interoperable across all smartphone platforms.

The performance of browser-based mobile web applications continues to improve, but there still remain some challenges with mobile browser fragmentation. Browser support on a majority of the smartphone platforms is more consistent than those that don’t support HTML5. Persistent storage and access to user interface features via standards-based Application Program Interfaces (APIs) may one day reduce the demand for platform-specific native apps. However, developing native apps and content for specific platforms can be equally challenging due to operating system fragmentation issues.

The biggest difference between content developed for the mobile browser and content developed using a native app approach is that native apps can require many platforms to support whereas mobile web content can require many browsers to support. Until recently, developers were forced to create native apps inside each mobile platform’s Software Development Kit (SDK) or Integrated Development Environment (IDE) in order to support each platform. It is now possible to develop content using HTML5 and deliver it through both the mobile browser and packaged as a native app. The choice of which type to develop is both an engineering and a design decision that should be based on a solid set of requirements. There are advantages and disadvantages to both approaches, but that discussion is beyond the scope of this paper.

3.4. Attitudes Toward Mobile Courses

The responses reflecting participants’ attitudes toward receiving mobile training were evenly distributed, as one third of participants responded “yes” to receiving their annual training using a mobile device while another third responded “no,” and the final third was unsure. These answers reflect the fact that none of the respondents have previously accessed a mobile version of any course.

We anticipate seeing different results to this type of question after completing our study on the effectiveness on mobile course delivery. We suspect that the attitudes among DoD stakeholders about accessing mandatory training on their mobile device as a secondary option to desktop computer-based training will heavily depend on the effectiveness of the mobile course design and length of content. One of the main goals of this study is to research and analyze whether mandatory training could be made to feel less forced upon them if offered as a mobile alternative, allowing true self-paced opportunities for completion. These attitudes will be further examined after collecting feedback using an end-of-course survey as well as collecting qualitative data during focus group sessions scheduled during the study.

Finally, the goal of this paper was to provide the results of our survey to investigate mobile device proliferation and usage by a wide range of DoD stakeholders. We plan to share the results of the ADL study on the effectiveness of mobile course delivery at the end of 2011. It is expected that the discussion within the DoD learning community regarding the challenges associated with mobile deployment will continue beyond this paper, and we hope to lead that discussion by providing resources and best practices where needed. ADL continues to conduct applied research within areas of mobile learning other than self-paced courses including but not limited to the following: performance support, adaptive personal learning assistants, spaced repetition, job aids, location-based learning, augmented reality, and mobile game-based learning. ADL will continue to strive to be at the forefront of this constantly evolving field and will participate in applied research of these new capabilities to help improve readiness within the military.

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